SEQUENCE LISTING

<110> MIETKIEWSKA, Elzbieta et al.

<120> FATTY ACID ELONGASE (FAE) GENES AND THEIR UTILITY IN INCREASING ERUCIC ACID AND OTHER VERY LONG-CHAIN FATTY ACID PROPORTIONS IN SEED OIL

<130> PAT 989W-2

<140> US 10/596,024
<141> 2004-11-24

<150> US 60/524,645
<151> 2003-11-25

<160> 27

<170> PatentIn version 3.2

<210> 1
<211> 18
<212> DNA
<213> Artificial

<220>
<223> F1 Forward Primer

<400> 1

tctwggwggm atgggttg 18

<210> 2
<211> 6
<212> PRT
<213> Artificial

<220>
<223> Coded by F1 Forward Primer

<400> 2

Leu Gly Gly Met Gly Cys
1 5

<210> 3
<211> 18
<212> DNA
<213> Artificial

<220>
<223> R1 Reverse Primer

<400> 3

trtaygcyar ctcrtacc 18

<210> 4
<211> 6
<212> PRT
<213> Artificial

<220>
<223> Coded by R1 Reverse Primer

<400> 4

Trp Tyr Glu Leu Ala Tyr
1 5

<210> 5
<211> 20
<212> DNA
<213> Artificial

<220>
<223> P Forward Primer

<400> 5

accatgtcag gaacaaaagc 20

<210> 6
<211> 23
<212> DNA
<213> Artificial

<220>
<223> PR Reverse Primer

<400> 6

ttaatttaat ggaacctcaa ccg 23

<210> 7
<211> 32
<212> DNA
<213> Artificial

<220>
<223> F2 Forward Primer

<400> 7

tcgaggatgt cgcttcaccg atttggaaac ac 32

<210> 8
<211> 33
<212> DNA
<213> Artificial

<220>
<223> R2 Reverse Primer

<400> 8

gtttccaaat cggtgaagcg acatcctcga tgg 33

<210> 9
<211> 25

<212> DNA
<213> Artificial

<220>
<223> F3 Forward Primer

<400> 9

taggatccat gtcaggaaca aaagc 25

<210> 10
<211> 30
<212> DNA
<213> Artificial

<220>
<223> R3 Reverse Primer

<400> 10

tagagctctt aatttaatgg aacctcaacc 30

<210> 11
<211> 30
<212> DNA
<213> Artificial

<220>
<223> R4 Reverse Primer

<400> 11

taggatcctt aatttaatgg aacctcaacc 30

<210> 12
<211> 17
<212> DNA
<213> Artificial

<220>

<223> F4 Forward Primer

<400> 12

atgtcaggaa caaaagc 17

<210> 13
<211> 22
<212> DNA
<213> Artificial

<220>
<223> R5 Reverse Primer

<400> 13

taatttaatg gaacctcaac cg 22

<210> 14
<211> 24
<212> DNA
<213> Artificial

<220>
<223> F5 Forward Primer

<400> 14

gcaatgacgt ccattaacgt aaag 24

<210> 15
<211> 21
<212> DNA
<213> Artificial

<220>
<223> R6 Reverse Primer

<400> 15

ttaggaccga ccgttttggg c 21

<210> 16
<211> 29
<212> DNA
<213> Artificial

<220>
<223> F6 Forward Primer

<400> 16

tatctagaat gacgtccatt aacgtaaag 29

<210> 17
<211> 27
<212> DNA
<213> Artificial

<220>
<223> R7 Reverse Primer

<400> 17

atggtacctt aggaccgacc gttttgg 27

<210> 18
<211> 22
<212> DNA
<213> Artificial

<220>
<223> NN-3 Primer

<400> 18

tttcttcgcc acttgtcact cc 22

<210> 19

<211> 21
<212> DNA
<213> Artificial

<220>
<223> NN-4 Primer

<400> 19

cgcgctatat tttgttttct a 21

<210> 20
<211> 32
<212> DNA
<213> Artificial

<220>
<223> OM087 Primer

<400> 20

agagagaggg atccatgagt gtgataggta gg 32

<210> 21
<211> 33
<212> DNA
<213> Artificial

<220>
<223> OM088 Primer

<400> 21

gaggaagaag gatccgggtc tatatactac tct 33

<210> 22
<211> 503
<212> PRT
<213> Tropaeolum majus

<400> 22

Met Ser Gly Thr Lys Ala Thr Ser Val Ser Val Pro Leu Pro Asp Phe
1 5 10 15

Lys Gln Ser Val Asn Leu Lys Tyr Val Lys Leu Gly Tyr His Tyr Ser
20 25 30

Ile Thr His Ala Met Tyr Leu Phe Leu Thr Pro Leu Leu Leu Ile Met
35 40 45

Ser Ala Gln Ile Ser Thr Phe Ser Ile Gln Asp Phe His His Leu Tyr
50 55 60

Asn His Leu Ile Leu His Asn Leu Ser Ser Leu Ile Leu Cys Ile Ala
65 70 75 80

Leu Leu Leu Phe Val Leu Thr Leu Tyr Phe Leu Thr Arg Pro Thr Pro
85 90 95

Val Tyr Leu Leu Asn Phe Ser Cys Tyr Lys Pro Asp Ala Ile His Lys
100 105 110

Cys Asp Arg Arg Arg Phe Met Asp Thr Ile Arg Gly Met Gly Thr Tyr
115 120 125

Thr Glu Glu Asn Ile Glu Phe Gln Arg Lys Val Leu Glu Arg Ser Gly
130 135 140

Ile Gly Glu Ser Ser Tyr Leu Pro Pro Thr Val Phe Lys Ile Pro Pro
145 150 155 160

Arg Val Tyr Asp Ala Glu Glu Arg Ala Glu Ala Glu Met Leu Met Phe
165 170 175

Gly Ala Val Asp Gly Leu Phe Glu Lys Ile Ser Val Lys Pro Asn Gln
180 185 190

Ile Gly Val Leu Val Val Asn Cys Gly Leu Phe Asn Pro Ile Pro Ser
195 200 205

Leu Ser Ser Met Ile Val Asn Arg Tyr Lys Met Arg Gly Asn Val Phe
210 215 220

Ser Tyr Asn Leu Gly Gly Met Gly Cys Ser Ala Gly Val Ile Ser Ile
225 230 235 240

Asp Leu Ala Lys Asp Leu Leu Gln Val Arg Pro Asn Ser Tyr Ala Leu
245 250 255

Val Val Ser Leu Glu Cys Ile Ser Lys Asn Leu Tyr Leu Gly Glu Gln
260 265 270

Arg Ser Met Leu Val Ser Asn Cys Leu Phe Arg Met Gly Gly Ala Ala
275 280 285

Ile Leu Leu Ser Asn Lys Met Ser Asp Arg Trp Arg Ser Lys Tyr Arg
290 295 300

Leu Val His Thr Val Arg Thr His Lys Gly Thr Glu Asp Asn Cys Phe
305 310 315 320

Ser Cys Val Thr Arg Lys Glu Asp Ser Asp Gly Lys Ile Gly Ile Ser
325 330 335

Leu Ser Lys Asn Leu Met Ala Val Ala Gly Asp Ala Leu Lys Thr Asn
340 345 350

Ile Thr Thr Leu Gly Pro Leu Val Leu Pro Met Ser Glu Gln Leu Leu
355 360 365

Phe Phe Ala Thr Leu Val Gly Lys Lys Val Phe Lys Met Lys Leu Gln
370 375 380

Pro Tyr Ile Pro Asp Phe Lys Leu Ala Phe Glu His Phe Cys Ile His
385 390 395 400

Ala Gly Gly Arg Ala Val Leu Asp Glu Leu Glu Lys Asn Leu Lys Leu
405 410 415

Ser Ser Trp His Met Glu Pro Ser Arg Met Ser Leu Tyr Arg Phe Gly
420 425 430

Asn Thr Ser Ser Ser Ser Leu Trp Tyr Glu Leu Ala Tyr Ser Glu Ala
435 440 445

Lys Gly Arg Ile Lys Lys Gly Asp Arg Val Trp Gln Ile Ala Phe Gly
450 455 460

Ser Gly Phe Lys Cys Asn Ser Ala Val Trp Lys Ala Leu Arg Asn Val
465 470 475 480

Asn Pro Ala Glu Glu Lys Asn Pro Trp Met Asp Glu Ile His Leu Phe
485 490 495

Pro Val Glu Val Pro Leu Asn
500

<210> 23
<211> 1765
<212> DNA
<213> Tropaeolum majus

<400> 23

agttttttt gttgagaata accatgtcag gaacaaaagc aacatcagtt tctgttccac 60

tgcctgattt caagcaatca gttaatctaa aatatgttaa acttggttat cattactcga 120

tcactcatgc aatgtatctt tttctaaccc ctcttcttct cataatgtct gctcaaatct 180

caactttctc tattcaagat tttcaccatc tttataacca tcttatcctc cacaatctct 240

catcccttat cctatgcatc gctctcctcc tcttcgtctt aaccctctat ttccttactc 300

gtcccacgcc tgtttattta ctcaacttct cttgttacaa accggatgct attcacaaat 360

gcgaccgccg tcgtttcatg gacaccattc gtggaatggg tacttatacg gaagagaaca 420

tcgagtttca aaggaaagtt ctagaaaggt ccggaatagg ggaatcgtct tatcttcctc 480

cgactgtgtt taaaattcct cctagggttt acgatgcgga ggaacgcgcg gaggctgaga 540

tgctgatgtt cggtgcggtt gatgggcttt tcgagaaaat atctgttaaa ccgaatcaaa 600

tcggggtttt ggttgtgaat tgtgggttgt ttaatccgat accgtcttta tcttccatga 660

ttgtgaatcg ctacaagatg agagggaatg tttttagtta taatttgggt ggaatgggtt 720

gtagtgcggg tgtgatttcg attgatcttg ctaaagatct tcttcaggtt cgtcccaact 780

catatgcttt ggtggttagt ttggaatgta tctcgaagaa cttgtatctc ggtgaacaaa 840

gatcgatgct tgtttccaac tgtttgtttc gaatgggtgg ggcggcgatt ttgctttcga 900

ataaaatgtc ggatcgatgg agatcaaagt atagattggt tcatacggtt cgaacccaca 960

agggtaccga ggataactgc ttttcttgcg taactagaaa ggaagactcg gacgggaaga 1020

tcggtatttc tttatcgaag aacctaatgg ctgttgccgg agacgcattg aagactaata 1080

tcacaaccct cggaccactt gttctaccca tgtcggaaca attactcttc ttcgctactt 1140

tggtcggaaa aaaggttttc aagatgaagc tacagccgta tataccggat ttcaagttgg 1200

ctttcgagca tttctgtatt catgcaggtg gaagagctgt tctggatgaa ttggagaaga 1260

acttgaagct ttcgagttgg catatggaac catcgaggat gtcgctttac cgatttggaa 1320

acacgtcgag tagttcgctt tggtacgagt tggcttattc ggaggcgaaa gggagaataa 1380

agaagggaga tcgagtatgg caaatcgcgt ttgggtcggg atttaagtgt aacagtgcgg 1440

tgtggaaggc tctaaggaat gttaatccgg cggaagagaa aaatccttgg atggatgaga 1500

ttcacctatt tccggttgag gttccattaa attaaaacct atcttcaagt tacaagttgt 1560

tgttgttgtt tcattaggtt taataataag ctaatatgga aagcctttct actctctttt 1620

ttttccactt ttttttttca atttcagagt tgggtcttag ttgtatcatc tacatgagtg 1680

tattcgctat gcgctattcg ctattcgcta ttcactagtt aataaaatca aacgtccaaa 1740

aaaaaaaaaa aaaaaaaaaa aaaaa 1765

<210> 24
<211> 506
<212> PRT
<213> Crambe abyssinica

<400> 24

Met Thr Ser Ile Asn Val Lys Leu Leu Tyr His Tyr Val Ile Thr Asn
1 5 10 15

Leu Phe Asn Leu Cys Phe Phe Pro Leu Thr Ala Ile Val Ala Gly Lys
20 25 30

Ala Ser Arg Leu Thr Ile Asp Asp Leu His His Leu Tyr Tyr Ser Tyr
35 40 45

Leu Gln His Asn Val Ile Thr Ile Ala Pro Leu Phe Ala Phe Thr Val
50 55 60

Phe Gly Ser Ile Leu Tyr Ile Val Thr Arg Pro Lys Pro Val Tyr Leu
65 70 75 80

Val Glu Tyr Ser Cys Tyr Leu Pro Pro Thr Gln Cys Arg Ser Ser Ile
85 90 95

Ser Lys Val Met Asp Ile Phe Tyr Gln Val Arg Lys Ala Asp Pro Phe
100 105 110

Arg Asn Gly Thr Cys Asp Asp Ser Ser Trp Leu Asp Phe Leu Arg Lys
115 120 125

Ile Gln Glu Arg Ser Gly Leu Gly Asp Glu Thr His Gly Pro Glu Gly
130 135 140

Leu Leu Gln Val Pro Pro Arg Lys Thr Phe Ala Ala Ala Arg Glu Glu
145 150 155 160

Thr Glu Gln Val Ile Val Gly Ala Leu Lys Asn Leu Phe Glu Asn Thr
165 170 175

Lys Val Asn Pro Lys Asp Ile Gly Ile Leu Val Val Asn Ser Ser Met
180 185 190

Phe Asn Pro Thr Pro Ser Leu Ser Ala Met Val Val Asn Thr Phe Lys
195 200 205

Leu Arg Ser Asn Val Arg Ser Phe Asn Leu Gly Gly Met Gly Cys Ser

210 215 220

Ala Gly Val Ile Ala Ile Asp Leu Ala Lys Asp Leu Leu His Val His
225 230 235 240

Lys Asn Thr Tyr Ala Leu Val Val Ser Thr Glu Asn Ile Thr Tyr Asn
245 250 255

Ile Tyr Ala Gly Asp Asn Arg Ser Met Met Val Ser Asn Cys Leu Phe
260 265 270

Arg Val Gly Gly Ala Ala Ile Leu Leu Ser Asn Lys Pro Arg Asp Arg
275 280 285

Arg Arg Ser Lys Tyr Glu Leu Val His Thr Val Arg Thr His Thr Gly
290 295 300

Ala Asp Asp Lys Ser Phe Arg Cys Val Gln Gln Gly Asp Asp Glu Asn
305 310 315 320

Gly Lys Thr Gly Val Ser Leu Ser Lys Asp Ile Thr Glu Val Ala Gly
325 330 335

Arg Thr Val Lys Lys Asn Ile Ala Thr Leu Gly Pro Leu Ile Leu Pro
340 345 350

Leu Ser Glu Lys Leu Leu Phe Phe Val Thr Phe Met Ala Lys Lys Leu
355 360 365

Phe Lys Asp Lys Val Lys His Tyr Tyr Val Pro Asp Phe Lys Leu Ala
370 375 380

Ile Asp His Phe Cys Ile His Ala Gly Gly Arg Ala Val Ile Asp Val
385 390 395 400

Leu Glu Lys Asn Leu Gly Leu Ala Pro Ile Asp Val Glu Ala Ser Arg
405 410 415

Ser Thr Leu His Arg Phe Gly Asn Thr Ser Ser Ser Ser Ile Trp Tyr
420 425 430

Glu Leu Ala Tyr Ile Glu Ala Lys Gly Arg Met Lys Lys Gly Asn Lys
435 440 445

Val Trp Gln Ile Ala Leu Gly Ser Gly Phe Lys Cys Asn Ser Ala Val
450 455 460

Trp Val Ala Leu Ser Asn Val Lys Ala Ser Thr Asn Ser Pro Trp Glu
465 470 475 480

His Cys Ile Asp Arg Tyr Pro Val Lys Ile Asp Ser Asp Ser Ala Lys
485 490 495

Ser Glu Thr Arg Ala Gln Asn Gly Arg Ser
500 505

<210> 25
<211> 1521
<212> DNA
<213> Crambe abyssinica

<400> 25

atgacgtcca ttaacgtaaa gctcctttac cattacgtca taaccaacct ttttaacctc 60

tgtttctttc cgttaacggc gatcgtcgcc gggaaagcct ctcggcttac catagacgat 120

cttcaccact tatattattc ctatctccaa cacaacgtca taaccatagc tccactcttt 180

gcctttaccg ttttcggttc gattctctac atcgtgaccc ggcccaaacc ggtttacctc 240

gttgagtact catgctacct tccaccaacg cagtgtagat caagtatctc caaggtcatg 300

gatatatttt atcaagtaag aaaagctgat ccttttcgta acgggacatg cgatgactcg 360

tcctggcttg acttcttgag gaagattcaa gaacgttcag gtctaggcga cgaaactcac 420

ggccccgagg gactgcttca ggtccctccc cggaagactt ttgcggcggc gcgtgaagag 480

acggagcaag taatcgtcgg tgcgctgaaa aatctattcg agaacaccaa agttaaccct 540

aaagatatag gtatacttgt ggtgaactca agcatgttta atccaactcc ttcactctca 600

gcgatggtcg ttaatacttt caagctccga agtaacgtaa gaagctttaa ccttggtggc 660

atgggttgta gtgctggcgt tatagccatt gatctggcta aggacttgtt gcatgtccat 720

aaaaacacgt atgctcttgt ggtgagcaca gagaacatca cttataacat ttacgctggc 780

gataatagat ccatgatggt ttcaaactgc ttgttccgtg ttggcggggc cgctattttg 840

ctctccaaca agcctagaga tcgaagacgg tccaaatacg agctagttca cacggtccga 900

acacataccg gagctgatga caagtctttc cgatgcgtcc aacaaggaga cgatgagaac 960

ggcaaaaccg gagtgagttt gtccaaggac ataaccgagg ttgctggtcg aacggttaag 1020

aaaaacatag caacattggg tcctttgatt cttcctttaa gcgagaaact tctttttttc 1080

gttaccttca tggccaagaa acttttcaaa gataaagtta agcattacta tgtcccggac 1140

ttcaagcttg ctattgacca tttttgtata catgcgggag gcagagccgt gatcgatgtg 1200

ctagagaaga atttaggcct agcaccgatc gatgtagagg catcaagatc aacgttacat 1260

agatttggta acacatcatc tagctcaata tggtatgagt tggcatacat agaggcaaaa 1320

ggaaggatga agaaaggtaa taaagtttgg cagattgctt tagggtcagg ctttaagtgt 1380

aacagtgcgg tttgggtagc tttaagcaat gtcaaggctt cgacaaatag tccttgggaa 1440

cattgcatcg atagataccc ggttaaaatt gattctgatt cagctaagtc agagactcgt 1500

gcccaaaacg gtcggtccta a 1521

<210> 26
<211> 506
<212> PRT
<213> Arabidopsis sp.

<400> 26

Met Thr Ser Val Asn Val Lys Leu Leu Tyr Arg Tyr Val Leu Thr Asn
1 5 10 15

Phe Phe Asn Leu Cys Leu Phe Pro Leu Thr Ala Phe Leu Ala Gly Lys
20 25 30

Ala Ser Arg Leu Thr Ile Asn Asp Leu His Asn Phe Leu Ser Tyr Leu
35 40 45

Gln His Asn Leu Ile Thr Val Thr Leu Leu Phe Ala Phe Thr Val Phe
50 55 60

Gly Leu Val Leu Tyr Ile Val Thr Arg Pro Asn Pro Val Tyr Leu Val
65 70 75 80

Asp Tyr Ser Cys Tyr Leu Pro Pro Pro His Leu Lys Val Ser Val Ser
85 90 95

Lys Val Met Asp Ile Phe Tyr Gln Ile Arg Lys Ala Asp Thr Ser Ser
100 105 110

Arg Asn Val Ala Cys Asp Asp Pro Ser Ser Leu Asp Phe Leu Arg Lys
115 120 125

Ile Gln Glu Arg Ser Gly Leu Gly Asp Glu Thr Tyr Ser Pro Glu Gly
130 135 140

Leu Ile His Val Pro Pro Arg Lys Thr Phe Ala Ala Ser Arg Glu Glu
145 150 155 160

Thr Glu Lys Val Ile Ile Gly Ala Leu Glu Asn Leu Phe Glu Asn Thr
165 170 175

Lys Val Asn Pro Arg Glu Ile Gly Ile Leu Val Val Asn Ser Ser Met
180 185 190

Phe Asn Pro Thr Pro Ser Leu Ser Ala Met Val Val Asn Thr Phe Lys
195 200 205

Leu Arg Ser Asn Ile Lys Ser Phe Asn Leu Gly Gly Met Gly Cys Ser
210 215 220

Ala Gly Val Ile Ala Ile Asp Leu Ala Lys Asp Leu Leu His Val His
225 230 235 240

Lys Asn Thr Tyr Ala Leu Val Val Ser Thr Glu Asn Ile Thr Gln Gly
245 250 255

Ile Tyr Ala Gly Glu Asn Arg Ser Met Met Val Ser Asn Cys Leu Phe
260 265 270

Arg Val Gly Gly Ala Ala Ile Leu Leu Ser Asn Lys Ser Gly Asp Arg
275 280 285

Arg Arg Ser Lys Tyr Lys Leu Val His Thr Val Arg Thr His Thr Gly
290 295 300

Ala Asp Asp Lys Ser Phe Arg Cys Val Gln Gln Glu Asp Asp Glu Ser
305 310 315 320

Gly Lys Ile Gly Val Cys Leu Ser Lys Asp Ile Thr Asn Val Ala Gly
325 330 335

Thr Thr Leu Thr Lys Asn Ile Ala Thr Leu Gly Pro Leu Ile Leu Pro
340 345 350

Leu Ser Glu Lys Phe Leu Phe Phe Ala Thr Phe Val Ala Lys Lys Leu
355 360 365

Leu Lys Asp Lys Ile Lys His Tyr Tyr Val Pro Asp Phe Lys Leu Ala
370 375 380

Val Asp His Phe Cys Ile His Ala Gly Gly Arg Ala Val Ile Asp Glu
385 390 395 400

Leu Glu Lys Asn Leu Gly Leu Ser Pro Ile Asp Val Glu Ala Ser Arg
405 410 415

Ser Thr Leu His Arg Phe Gly Asn Thr Ser Ser Ser Ser Ile Trp Tyr
420 425 430

Glu Leu Ala Tyr Ile Glu Ala Lys Gly Arg Met Lys Lys Gly Asn Lys
435 440 445

Ala Trp Gln Ile Ala Leu Gly Ser Gly Phe Lys Cys Asn Ser Ala Val
450 455 460

Trp Val Ala Leu Arg Asn Val Lys Ala Ser Ala Asn Ser Pro Trp Gln
465 470 475 480

His Cys Ile Asp Arg Tyr Pro Val Lys Ile Asp Ser Asp Leu Ser Lys

485 490 495

Ser Lys Thr His Val Gln Asn Gly Arg Ser
500 505

<210> 27
<211> 1521
<212> DNA
<213> Arabidopsis sp.

<400> 27

atgacgtccg ttaacgttaa gctcctttac cgttacgtct taaccaactt tttcaacctc 60

tgtttgttcc cgttaacggc gttcctcgcc ggaaaagcct ctcggcttac cataaacgat 120

ctccacaact tcctttccta tctccaacac aaccttataa cagtaacttt actctttgct 180

ttcactgttt tcggttttggt tctctacatc gtaacccgac ccaatccggt ttatctcgtt 240

gactactcgt gttaccttcc accaccgcat ctcaaagtta gtgtctctaa agtcatggat 300

attttctacc aaataagaaa agctgatact tcttcacgga acgtggcatg tgatgatccg 360

tcctcgctcg atttcctgag gaagattcaa gagcgttcag gtctaggtga tgagacgtac 420

agtcctgagg gactcattca cgtaccaccg cggaagactt ttgcagcgtc acgtgaagag 480

acagagaagg ttatcatcgg tgcgctcgaa aatctattcg agaacaccaa agttaaccct 540

agagagattg gtatacttgt ggtgaactca agcatgttta atccaactcc ttcgctatcc 600

gctatggtcg ttaatacttt caagctccga agcaacatca aaagctttaa tctaggagga 660

atgggttgta gtgctggtgt tattgccatt gatttggcta aagacttgtt gcatgttcat 720

aaaaacactt atgctcttgt ggtgagcact gagaacatca cacaaggcat ttatgctgga 780

gaaaatagat caatgatggt tagcaattgc ttgtttcgtg ttggtggggc cgcgattttg 840

ctctctaaca agtcgggaga ccggagacgg tccaagtaca agctagttca cacggtccga 900

acgcatactg gagctgatga caagtctttt cgatgtgtgc aacaagaaga cgatgagagc 960

ggcaaaatcg gagtttgtct gtcaaaggac ataaccaatg ttgcggggac aacacttacg 1020

aaaaatatag caacattggg tccgttgatt cttcctttaa gcgaaaagtt tctttttttc 1080

gctaccttcg tcgccaagaa acttctaaag gataaaatca agcattacta tgttccggat 1140

ttcaagcttg ctgttgacca tttctgtatt catgccggag gcagagccgt gatcgatgag 1200

ctagagaaga acttaggact atcgccgatc gatgtggagg catctagatc aacgttacat 1260

agatttggga atacttcatc tagctcaatt tggtatgaat tagcatacat agaggcaaag 1320

ggaagaatga agaaagggaa taaagcttgg cagattgctt taggatcagg gtttaagtgt 1380

aatagtgcgg tttgggtggc tctacgcaat gtcaaggcat cggcaaatag tccttggcaa 1440

cattgcatcg atagatatcc ggttaaaatt gattctgatt tgtcaaagtc aaagactcat 1500

gtccaaaacg gtcggtccta a 1521